

# Memorandum

Date : March 10, 1995

To : John Caffrey, Chairman  
State Water Resources Control Board  
901 P Street  
Sacramento, California 95812

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EXECUTIVE OFFICE

From : Department of Water Resources

Subject: Comments of the Department of Water Resources on the Draft Water Quality Control Plan and Environmental Report for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary.

Please find enclosed the Department's further comments on the Draft Plan and Environmental Report for the Bay-Delta Estuary that we indicated, at the Board's February 23 hearing, we would be submitting by the close of the designated comment period. Also, please find enclosed the joint comments of the four agencies party to the Suisun Marsh Preservation Agreement (DWR, USBR, DFG, and the Suisun Resource Conservation District). The Department is not submitting any further specific comments on the monitoring aspects of the Draft Plan. The Department does, however, support the comments which the Joint Water Users are submitting on this issue.

If you have any questions regarding this submittal, please have your staff contact Mike Ford at CalNet 453-8348.



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### General Comments:

- Generally, the report is well written and strives to balance the complex and often conflicting information regarding the Bay-Delta's environmental resources. The SWRCB and its staff are to be commended for their considerable efforts in putting together this document in relatively little time.

- We found some significant errors, particularly in the sections describing the entrapment zone, delta smelt and Sacramento splittail.

- Erroneous biological benefits are attributed to the entrapment zone in the report. Information developed by the U.S. Geological Survey in the 1994 entrapment zone studies outdates some of the Report's descriptions. This information should be included in the report and the sections on the entrapment zone should be revised in accordance with this information.

- The sections on delta smelt and splittail need to be updated with the new significant information derived from field studies and analysis on these species during 1994. In particular, whole sections in the Report should be updated with information derived from the August 1994 Biological Assessment by the Department of Water Resources (DWR) and U.S. Bureau of Reclamation (USBR); DWR's "Information Relative to the Proposed Listing of the Sacramento Splittail" dated February 21, 1995; and a DWR report (with Attachments) commenting on the draft 1995 Biological Opinion for delta smelt. Copies of these documents are attached for the convenience of the State Board's staff.

- In many cases, the report uses and cites information attributed to Bulletin 160-93 (the most recent update of the California Water Plan). However, we found numerous inconsistencies with Bulletin 160-93 information. It appears that the draft Bulletin 160-93 may have been used to develop this report. For the most part, changes in Bulletin 160-93 from draft to final are relatively minor. However, there was one substantive change made that affected the water budget, groundwater overdraft. On Page VIII-62 under "Ground Water Pumping", the SWRCB's environmental report states that the average amount of ground water overdraft in California is about 1.0 MAF per year. In fact, the final Bulletin 160-93, published in October 1994, identifies this amount as 1.3 MAF per year. This significant increase in ground water overdraft affects the economic analysis of the SWRCB's preferred alternative. DWR would be happy to work with SWRCB staff finalizing the environmental report to ensure that the most accurate and up-to-date information from the final Bulletin 160-93 is used for the SWRCB's environmental report.

Specific Comments:

- Page I-7, para. 2 --- DWR has contracts with 29 public agencies to deliver water, not 30 agencies.
- Page IV-41, para. 4 -- The statement that biological productivity is highest in the entrapment zone is wrong. Biological production, or biomass may be higher in the entrapment zone due solely to the entrapment process, but productivity (rate of growth), is not higher in the entrapment zone when compared to outside the entrapment zone, for any species measured. In fact, phytoplankton productivity may be lower in the entrapment zone than outside, due to elevated levels of turbidity in the entrapment zone (see your references, DWR 1992B and Kimmerer's report on the entrapment zone).
- Page IV-42. para.5 --- '...the marsh consists of a unique diversity of habitats, including tidal wetlands, sloughs, managed diked wetlands, unmanaged seasonal wetlands, and upland grasslands.' insert: A majority of the Suisun Marsh consists of managed diked wetlands, however, numerous studies have established that tidal marshlands can have significant....."
- Page IV-42. para.6 Surface Water Hydrology --- This heading should be changed to 'Land Use'.
- Page IV-43. para. 1. --- The DFG owns and manages 14,700 acres. The Solano County Farmlands and Open Space Foundation owns 1,050 acres of tidal wetlands, 940 acres of Potrero Hills uplands, and a 78 acre diked managed wetland. The U.S. Navy administers 1,400 acres of tidal wetlands on the channel islands of Suisun Bay.
- Page IV-43. para 2. Vegetation --- The discussion is limited to undiked tidal marsh. Insert: Within the diked managed wetlands of the Suisun Marsh, water management and the resulting controlled wetland hydroperiod has been shown to have the most significant effect on vegetation typused by several sensitive fish including delta smelt, longfin smelt, chinook salmon, and splittail.
- Page IV-43. para. 6. --- Resident breeding populations of two endangered species (the salt marsh harvest mouse and the California clapper rail), one threatened species (the California black rail), and two candidate species for federal listing (the Suisun song sparrow and Suisun ornate shrew) have been documented in Suisun Marsh (DWR 1994; Evens and Collins 1992; Hays 1990; Evens et al 1989). Two state listed plant species (Mason's lilaepsis and Soft bird's beak) occur in Suisun Marsh in addition to three federal candidate plant species (Suisun Slough thistle, Suisun aster, and Delta tule pea) (DWR 1994; Ruygt 1994; Fieldler and Zebell 1993).
- Page V-3, para. 4 -- References to the driest and longest

droughts are incorrect. The years should read either 1987-1992 or 1985-1992 (excluding 1986).

- Page V-8, para. 3 -- The second sentence in this paragraph needs to be clarified. The statement made does not hold true for wet years (note this year) and above normal years, depending upon antecedent conditions, particularly reservoir storage from the previous year.

- Page V-11, para. 4, third sentence -- While conventional thought is that the entrapment zone forms principally as a result of two-layered flow (gravitational circulation), studies conducted by the US Geological Survey (USGS) during 1994 showed that gravitational circulation occurred near Carquinez Strait, far downstream of the expected position based on specific conductivity profiles in the estuary. These results indicate that the biological significance of the entrapment zone needs to be reconsidered. Additional studies will be conducted by the Interagency Ecological Program (IEP) during the spring of 1995.

- Page V-13, para. 1, first three sentences -- The statements made here regarding the mechanics and benefits of the entrapment zone are incorrect and should be revised. First, the major physical process thought to influence the entrapment zone (two-layered, gravitational caused circulation), preclude such a zone being established in the shoals or shallow areas of any location. Simply, there is not sufficient depth to establish gravitational circulation. Second, regardless of the location of the entrapment zone, phytoplankton production will always be highest in the shoal areas than the deeper channels (everything else being equal) due to longer exposure to solar radiation. Production (biomass) is highest when the entrapment zone is adjacent to the shoal areas due to the exchange of phytoplankton cells from the shoals (where productivity is highest) to the entrapment zone (driven by winds and tidal exchange), which then traps the cells and accounts for the higher biomass (but not productivity).

- Page V-13, para. 5, last sentence -- Actually, some (very few) siphons and pumps are screened in the Delta. The actual number and condition of these diversions and screens are unknown. There may be less than six such screened diversions, but at least one 16-inch operating siphon on Bacon Island is screened. The effects of this diversion and efficiency of the screen is being studied by the DWR under the IEP's Agricultural Diversion study.

- Page V-18, para. 2 -- Additional information on the potential effects on delta smelt and striped bass from PG&E's power generating facilities in the estuary is available from the DWR's and U.S Bureau of Reclamation's (USBR) August 1994 Biological Assessment.

- Page V-27, para. 1, first sentence -- Believe that global warming is still a theory and not yet a fact.

- Page V-36, para. 5 -- The description ascribed to Kimmerer (1992) is not correct. As previously noted above, location of the entrapment zone has no relationship to phytoplankton growth rates. However, it is true that when the entrapment zone is upstream in the deeper channels, then less biomass may build up than when it is downstream in the deep channels adjacent to the broad shoals.

- Page 45, para. 4 - Causes of Decline in Zooplankton -- A paper published in the Marine Ecology Progress Series by Kimmerer et al (1994) (copy attached) describes predation by *Potomacorbula* as the likely cause of substantial declines in zooplankton of San Francisco Bay. This section of the Environmental Report should be updated with this new information.

- Page V-55 - V-57, Section a. Sacramento Splittail -- This whole section needs to be updated with current information provided by the Department of Fish and Game (DFG) and DWR on splittail (see attachment from DWR dated February 1995, "Information Relative to the Proposed Listing of Sacramento Splittail." In summary, contrary to the information presented in the Environmental Report:

A) Four abundance indices developed for diverse regions of the estuary provide no evidence that there has been a decline in the number of adult splittail (Page V-55, paragraphs 3-5). While there is some indication that production of young splittail may have been reduced in the late 1980's, recent data from a number of surveys suggest that recruitment has improved in recent years.

B) Data from recent surveys show that splittail are present at least seasonally in a number of Central Valley tributaries, including about 13 miles upstream the Feather River from its confluence with the Sacramento River. The species is clearly not "confined to the lower reaches of the Sacramento and San Joaquin Rivers, the Delta, Suisun and Napa marshes and tributaries of North San Pablo Bay" (Page V-55, Paragraph 1).

C) Suisun Bay does not appear to be the center of the range of splittail as is implied, but rather is a component of a broader core of distribution (Page V-55, first paragraph).

D) The 6-year drought appears to be the major cause of recent low abundance levels of young splittail in the estuary based on a strong correlation with delta outflow (Page V-57, first paragraph). Abundance is also well correlated with the duration of floodplain inundation, which may provide a large amount of additional spawning, rearing and foraging habitat in wet years. Except for 1993 and the current water year, little flooding has occurred in the range of splittail since 1986, perhaps leading to a series of weaker year-classes in the estuary.

E) Although hydrology appears to be important to the production of young splittail, USFWS beach seine data and recent egg and larval analyses show that spawning can be successful in many areas of the Sacramento and San Joaquin rivers, and the northern and central Delta in both wet and dry years.

F) Salinities during recent years in Suisun Bay, the lower range of splittail distribution, were within levels tolerated by this species. Therefore, their required habitat could not have been greatly restricted (Page V-57, first paragraph, last sentence).

G) There is no evidence that entrainment loss at pumping plants is a primary factor influencing splittail abundance. Analysis of salvage data demonstrate that entrainment increases primarily when large numbers of splittail are present in the system.

- Page V-60, para. 2, last sentence -- While some, or many delta smelt may be transported downstream to the entrapment zone after hatching, many also remain upstream to rear in the channels of the lower Sacramento and San Joaquin Rivers. In fact, it should be noted here that recent analysis by DWR indicates that, on the average, more delta smelt have been caught in the Delta than in Suisun Bay (Appendix 1, pp. 2-3, attached). This occurred even when just the "good" years are analyzed. Midwater trawl results show an average of 36% of the delta smelt are caught in Suisun Bay and 63% in the Delta for the period 1967-1980. The summer townet index during the "good" period of 1969-1981 also show an average of 45% of the smelt reared in Suisun Bay, while 55% reared in upstream areas.

- Page V-62 and V-63, Causes of Decline -- The information contained in this section, particularly those paragraphs referencing correlations of increased diversions and decline of delta smelt are factually and technically incorrect. DFG and DWR could not find any significant statistical correlations, inverse or otherwise between delta smelt abundance in the summer or fall and exports for the SWP and CVP; abundance and salvage for the SWP and CVP; and abundance or salvage levels and the proportion of inflow diverted (DWR and USBR 1994, attached).

- Page V-62, para. 1, second sentence -- Hanson (1994) conducted an analysis to specifically test the hypothesis that adult fall abundance is dependent upon geographic distribution of juvenile delta smelt. He found no significant relationship between the percentage of juvenile delta smelt collected downstream of the Sacramento-San Joaquin River confluence and the corresponding fall midwater trawl abundance index (Appendix 1A, attached). This finding does not support the theory that a significant distribution of larval and juvenile delta smelt to Suisun Bay will result in a large fall index.

- Page V-58, para. and Page V-62, para. 3 -- While conventional thought is that delta smelt prefer shallow water, this may not necessarily be the case. On June 16, 1994 the IEP conducted deep and shallow water sampling in the San Joaquin River off Twitchell Island, the Sacramento River off Decker Island, and in Suisun Bay. Delta smelt densities were not significantly different between shallow and deep water areas within the San Joaquin River and Suisun Bay. However, densities were significantly different

between shallow and deep water habitats in the lower Sacramento River (Appendix 1B attached).

- Page V-67, para. 1, first sentence -- One of the references cited (DWR 1992a), does not support the statement that "The factor most strongly associated with the recent decline in the abundance of longfin smelt has been the increase in water diverted by the SWP and CVP during the winter and spring months when the smelt are spawning." What DWR 1992a does say is that "A major effect of the State water Project on longfin smelt appears to be due to entrainment at Clifton Court Forebay. Please correct this sentence.

- Page V-73, --- Although there is mention of a late-fall run in the San Joaquin system, this doesn't seem to be well-supported by escapement information. Hatchery production supplements the spring and winter runs in addition to the fall and late-fall mentioned in the report. Peak fall run spawning occurs in October and November in the Sacramento Valley streams and a little later in the San Joaquin system, not the October through March period mentioned in the report.

- Page V-74, --- Based on recent trawls at Sacramento, late-fall migration through the Delta likely occurs in November and December but may peak in January and February, not possibly in January as indicated in the text. It isn't clear that there were "enormous runs of salmon in the upper Sacramento, Pit and McCloud Rivers" in 1942. There are not good data on this but Kelly et al 1987 showed that the Central Valley catch and spawning escapement was low through about 1942 and rebounded to near peak levels by the mid-1940's. On the Feather River, by the time that Oroville Dam was built in the mid-1960's, most of the upstream habitat had already been lost. This isn't clear in the text.

- Page V-79, --- The winter run on the Sacramento River is the only one in the world, not just in California. There might have been one on the Calaveras River but its existence is poorly documented. There really aren't any reliable data to document that the winter run declined after Shasta was closed.

- Page V-81, --- The 4-Pumps Advisory Committee has approved a permanent barrier on the San Joaquin River near its confluence with the Merced River. Last paragraph, minimum flows may not help salmon.

- Page V-82, --- The first paragraph should specify that hatchery fall chinook were used in the tests.

- Page V-83, --- We don't really know when spring run smolts migrate, or even if they actually migrate as smolts. There is some evidence they migrate as post smolts and there are no data indicating that Delta mortality is significantly controlling their abundance. We are not even sure when they move through the Delta.

- Page V-84, --- As with spring run, it is not clear when the fish move through the Delta but the highest catches at the salvage facility occur in winter months. This doesn't seem consistent with the present text.

- Page V-90, para. 4 -- Figures 41 and 42 show that the decline occurred primarily in the older age classes. The age 3 numbers in the early 1980's were comparable to previous years, but the recent drought appeared to have caused a decrease. The older fish declined much earlier.

- Page V-90, para. 5, second to the last sentence -- The relationship between YOY and toxics is just as strong as DFG's outflow/export relationship. Add "and decreased outflow during the recent 6-year drought" at the end of the sentence (and just prior to the reference DFG 1992a).

- Page V-93, para. 1, last sentence -- Add "However, a large percentage of striped bass rear in the delta."

- Page V-93, para.4, fourth sentence -- These figures are an oversimplification of the model. Although they may illustrate relative effects, actual numbers should be viewed with caution.

- Page V-94, para. 2, second sentence -- Add "Suisun Bay/Marsh" to the end of the sentence.

- Page V-95, para. 5, second sentence -- The effect of outflow on water temperature is not "the" mechanism, but one possible mechanism that explains shad recruitment in drier years.

- Page VI-3, Striped Bass Models -- A model by C. Foe of toxics vs. abundance has also been developed.

The following comments pertain to Chapter VII in the environmental report, "Water Supply Impacts of the preferred alternative"

- Under D1485, in average year, there is a water shortage of about 900,000 acre-feet in San Joaquin Valley. This shortage is being met by overdrafting ground water basins in the valley. This imbalance of demand/supply in San Joaquin Valley has serious implications for the determination of water supply impacts of the preferred alternative and the corresponding economic impacts.

- Because the San Joaquin Valley as a whole has a shortage of about 900,000 acre-feet, any reduction of surface delivery from the Delta would directly increase the shortage within the valley.

- Any increase in groundwater pumping to offset reduction of surface delivery would increase overdraft in ground water basins. As overdraft is not a sustainable source of supply, this increase and its impact on ground water level and quality should be

addressed and the economic and environmental impacts of an increase in ground water mining should be evaluated.

- The SWRCB's analysis assumes that water shortages in the San Joaquin Valley which result from the draft plan will be offset by water transfers within the valley. Because there is no surplus supply in the San Joaquin Valley, any water transfers within the San Joaquin Valley to offset the reductions in surface water deliveries would come from land retirement, land fallowing, or increase in ground water overdraft. The preferred alternative assumes water transfers will reduce water supply impacts in the basin. This simply cannot be true when considering the fact that the valley has a permanent water shortage and that the CVP is not able to deliver full contract water in any year even when water is available in CVP storage facilities north of the Delta. Crop shifts are mentioned in the environmental report as a practice that would reduce the impact of the preferred alternative. We agree that crop shifts may occur in some areas. However, the assumption that "growers are always to fallow their least profitable crops" and will move to more profitable productions is a gross simplification of the process and would unreasonably underestimate the economic impacts of the preferred alternative. Farmers make decisions on their crop types based on a number of factors including water supply and its cost, soil, climate, pest control and the most important of all market conditions.

The preferred alternative reduces San Joaquin Valley water supplies in two ways, by reducing SWP/CVP export from the Delta and by reallocating the existing valley supply to environmental use in the San Joaquin River. The combined impacts of these actions would be in the range of .5 to 1 MAF in average and drought years respectively. Such a reduction in surface deliveries would reduce agricultural crop acreage by about 200,000 acres in average year, most likely lands which are used to grow crops such as cotton would be affected (Drought year impact would be much higher). This would result in a direct loss in crop production of about \$200 million, with associated total losses of about \$ 250 million. The environmental report has significantly underestimated the losses by assuming unreasonable assumptions such as increased ground water use, crop change, water transfer etc.

- We suggest that the Board should re-examine the suitability of the economic parameters, as well as, assumptions used to determine the economic impacts of the preferred alternative. The draft states that the economic losses are "within the range of the normal fluctuation in agricultural production" in the valley. A close examination of total losses indicates that 1) the losses are not within the normal fluctuation in agricultural productions, and 2) these losses present a reduction in economic output of the valley above and beyond the normal fluctuation of agricultural productions.

- Page VIII-32, mid-page, table of compliance monitoring stations: "S-75" should read "S-35".

- Page VIII-32. para. 2. --- Report indicates a discussion of environmental effect of standards on Suisun Marsh is divided into four sections: background, proposed standards, salinity conditions, and Suisun marsh biota. Sections on background, proposed standards, and salinity conditions follow. There is no section describing impacts of proposed standards on Suisun Marsh biota.

- Page VIII-33, Figure VIII-32: Station S-35 is not correctly located on the map. The location of this station is indicated with a dotted arrow on the attached copy of Figure VIII-32.

- Page VIII-34, para. 2, last sentence: --- "The DWR and the USBR are still developing a program to consistently achieve the 1978 Delta Plan western marsh standards, and they have not yet met the western marsh standards during the deficiency periods defined in the SMPA." should read, "During dry periods in 1984-1992, channel water salinities in the western Suisun Marsh exceeded the 1978 Delta Plan target salinity levels (standards were not in effect), as well as, the deficiency standards defined in the SMPA."

- Page VIII-34, para. 4, line 1: ---"In 1987, the DWR requested..." should read, "In 1987, the DWR, USBR, DFG, and SRCD requested..."

- Page VIII-34. para. 4. Last sentence: "The DWR and USBR plan to complete a Biological Assessment in 1996". --- The Biological Assessment requested by 1996 is no longer relevant. Portions of the study which are relevant were submitted to SWRCB in December 1994. Major remaining elements of the biological assessment study plan no longer reflect current water management of the Estuary. SWRCB has called for a Suisun Marsh Ecological Work Group to evaluate beneficial uses and water quality objectives for the Suisun Marsh ecosystem. This workgroup is the appropriate forum for future evaluations water quality standards in Suisun Marsh.

- Page VIII-34, para. 5, line 1: ---"During the SWRCB's current proceeding, the DWR again requested..." should read, "During the SWRCB's current proceeding, the DWR, USBR, DFG, and SRCD again requested..."

- Page VIII-35, para. 2, line 12: --- "Also, there should be a natural gradient of increasing salinity from east to west which is not reflected in the existing standards, but is included in this proposal." should read, "Also, there should be a natural gradient of increasing salinity from east to west which is not reflected in the existing standards, but is included in this proposal when deficiency period standards are in effect."

• Page VIII-36. para. 1. --- The Suisun Marsh Biological Assessment study plan approved by SWRCB staff addressed implementation of SMPA standards throughout Suisun Marsh under D-1485 hydrologic conditions. If a Biological Assessment is needed for future standards proposed by the Suisun Marsh Ecological Work Group, a new study plan will be necessary.

• Page VIII-36, para. 4 (after 1. - 10. listing) ---Insert after the last sentence of the paragraph "Creek flows into northwestern Suisun Marsh are regulated by the management of reservoirs on Green Valley and Suisun Creek watersheds, and are affected by urban development in the area."

• Page VIII-37, para. 2 (begins with: "The Suisun Marsh Salinity Control Gates...): --- Insert after the last sentence of the paragraph "Salinity in northwestern Marsh sloughs (e.g., S-97) is primarily affected by surface water inflows from local creeks and drainage water from the managed wetlands; and is relatively unaffected by Delta outflow and SMSCG operations."

• Page VIII-37. para. 6. --- 'The principal environmental concern regarding the marsh is conversion of existing brackish marsh to salt marsh.' Insert: Fish and wildlife agencies have also expressed concern with conversion of brackish marsh to freshwater marsh in efforts to meet internal Suisun Marsh standards.

• Page IX-15. para. 3. --- The Suisun Marsh Ecological Work Group should also include the EPA.

• Page IX-15. para. 3. --- 'The work group will:....' Suggested change: Topics that the Ecological Work Group should consider include:....".

• Page XIII-23. Suisun Slough Thistle. --- Delete: 'Last observed in 1974 .....'. Insert: Department of Water Resources staff have observed and mapped the distribution of this species at two locations in Suisun Marsh in 1991 - 1994 (DWR 1994).

• Page XIII-25. para. 4. --- Delete: '....especially in the Cutoff Slough vicinity,...' (The Cutoff Slough population is still present, but it is not the most dense concentration of rails in Suisun Marsh). California clapper rails are present in tidal marshes along the Grizzly Bay and western Suisun Bay shorelines, Suisun Slough, Cutoff Slough, and Hill Slough.

• Page XIII-26. --- Delete: 'The proposed increases in freshwater outflow are within the historical ranges of salinities experienced in the past and are not expected to adversely affect the California clapper rail.' California clapper rails were first observed in Suisun Marsh in 1979. There are no records of definitive surveys for clapper rails in Suisun Marsh before this time. It is unknown whether clapper rails were present in Suisun

Marsh when the historical ranges in salinities were affecting Suisun Marsh. There has been a reduction of suitable habitat for the species in the downstream reaches of the Estuary. It is unknown whether the proposed standards will adversely affect the California clapper rail in Suisun Marsh, but this is a possibility.

- Page XIII-36, third paragraph, first sentence -- The statement that delta smelt are most abundant in the entrapment zone for most of the year is not supported by any data, and conflicts with historical and current data. See previous comments on delta smelt in Chapter V.

- Page XIII-39, third paragraph -- The first two sentences are not supported by either historical or current data. Adult and juvenile delta smelt were and still are always found in greater abundance in the Delta than in Suisun Bay, in wet years or dry years, during either the "good" or "bad" periods. Please refer to the previous comments on delta smelt and in particular, Appendix 1.

The following comments pertain specifically to Chapter XII of the SWRCB's environmental report, "Economics"

- The conclusion reached in this Chapter regarding agricultural impacts is correctly qualified by the statement that, "The economic impact of implementation of the draft plan on agriculture may vary substantially depending on the extent that water can be transferred between users and on the extent that growers are able to respond to reduced availability of surface water by changing crops and pumping groundwater." The conclusion is that "Under the most pessimistic scenario..." net losses to producers average \$20 million annually.

- For reasons given below, we feel that this is an overly optimistic conclusion, even as qualified. It is also only part of the picture. First, growers don't deal with average circumstances only. The distribution of possible outcomes (i.e., variance) is more likely to be important to grower's economic decisions and financial viability and the affected regions' economic health than what average conditions are. If serious economic losses are experienced in quick succession, averages can be irrelevant. Because the draft plan increases the frequency and magnitude of shortage events, this is of real concern.

- As stated later in the environmental report, producers' income is only part of the losses to the San Joaquin Valley. The cited income multiplier of 2.7 means that losses in income in agriculture and in businesses directly and indirectly related to agriculture can be as high as \$54 million annually even if the \$20 million figure was appropriate as a lower bound. Although the environmental report is correct in stating that the multiplier number is conservative, this is still significant. Local businesses affected by farm production levels also do not exist in

an "average world".

- Agricultural impacts are reported as impacts to the San Joaquin Valley. Although, as the environmental report states, impacts can be relatively small compared to the whole Valley, this broad scope can mask very serious impacts in small regions or communities. It should be made clear that, although assessing the potential for these types impacts are outside of the scope of the report, it is important to realize that such effects are possible.

- In the agricultural sector, where regional problems are likely to be most acute, differences in water rights and water supply contract types as well as differences in the access to—or cost of—surface or ground water supplies during shortages can result in very different levels of economic impact. The economic health of some agricultural communities can be seriously affected by large drops in the production of specific types of crops because they are labor intensive or make use of a large amount of local goods and services to produce, haul, store, and process, or both. Other communities with a more diversified economic base may be relatively unfazed under the same circumstances.

- Similarly, communities which are more dependent upon maintaining agricultural land values for tax revenue purposes can be at a serious disadvantage compared to communities with other sources of revenue that are substantial. The former communities can lose a large amount of their capacity to provide needed community services if agricultural land values decline because of added unreliability.

- The potential for loss of State consumer welfare due to increases in the cost of food fiber which may accrue due to production cutbacks associated with water shortages is not addressed in the report. This effect, although it may be relatively small, should not be overlooked.

- Sole reliance on models to assess agricultural impacts can lead to serious bias; model studies should be augmented with institutional analysis and case studies for credibility.

- Models show economically optimal conditions for different scenarios of water availability, costs of inputs, crop market conditions, etc. As such they are useful tools for looking at the consequences of decisions which affect water availability from a limited perspective: what is obtainable if all factors of agricultural production are employed to their best economic advantage. This is only one piece of the puzzle, however. The institutional, social, infrastructure, financial, and environmental constraints and consequences associated with obtaining these economically optimal conditions can be only be roughly approximated, if an attempt to model them is made at all. While the Central Valley Agricultural Production Model has a provision to take some of these factors into account in its implicit cost function, the rationing model makes no such

allowance--a serious shortcoming.

- The effects of the time needed to adapt to changed conditions as well as the effects of any changes in required financial resources, and management and/or labor skills are also difficult to reflect in models. In addition, because of these factors and the dynamic nature of the marketplace, economically optimal conditions are literally never achievable.

- Depending upon the specific crops and geographic regions involved, the biases introduced by depending exclusively on model results can range from minimal to severe. For example, effects on farmers in specific regions growing for seasonal niche markets are unlikely to be captured in the model because of geographic and crop type aggregations. The farmer may place a high value on preserving a contractual relationship with a processing plant by maintaining the production of a crop which would otherwise be uneconomical in a shortage situation. Another example is the importance to the farmer of maintaining the production of low-income crops to avoid the loss of "base acreage" for federal crop programs.

- Although models do provide valuable insights about the economic forces involved (a major consideration in forecasting impacts), impact analyses should be augmented with specific knowledge about the other, sometimes very important, forces involved whenever possible. To the degree that this can be done, increased credibility can be attributed to the results. There is no indication that the scope of the report to augment model results with the additional analyses to verify their reasonableness.

- The agricultural impact analysis uses two simplistic scenarios for groundwater use for drought management. Although probably outside the scope of study, a more realistic analysis could reveal important economic impacts not apparent using the simplified approach.

- The long-term negative effects on pumping depths and the quality of the pumped supply are likely to be significant in some areas of the Central Valley and will be increasingly likely to affect all types of crop production, particularly during drought events. Increased water costs due to increased pumping depths can affect California's competitive advantage relative to other states and other countries.

- In addition to economic impacts, environmental impacts on natural ecosystems are possible. Falling ground water levels in some agricultural areas can adversely affect deep-rooted trees and shrubs which depend upon a water table sufficiently high to carry them through the dry season.

- A major effect of the proposed standards will be to add risk to an already risky agricultural production environment and to reduce income to already financially jeopardized agricultural

communities. In some geographic areas this combination is likely to further curtail investment in agricultural production (including the availability and cost of loans to meet crop production costs and for the capital needed to bring higher-valued, but financially riskier, tree fruit and row crops into production. The drop in income will also jeopardize the retirement of current debt and the value of farmland as equity, further limiting the ability to invest. These concerns are not adequately addressed in the agricultural impact valuations.

- Another important consideration is how variability in crop production will be affected by the proposed rule. Depending upon the geographical area involved and the nature of the market for the specific crop, the consequences can be serious. The ability of farmers to market some crops is dependent upon the reliability of production. Large food processors are likely to drop contracts with growers who cannot deliver with the consistency required in favor of contracts with more reliable growers in competing regions, states, or even countries. The location of grain drying and storage facilities, for example, is influenced by the availability of local farm output to create sufficient income. In turn, jobs in the local communities and costs to farmers are affected by the proximity of these facilities. If production variability increases sufficiently, the owners of such facilities may find the added risk to their income unacceptable, forcing them to close or relocate.

- The environmental report cites improvements in irrigation systems as a shortage management strategy that can be used by growers to "offset the impacts of reduced deliveries". In most cases, more careful management of their existing system would be the response to reduced water availability. In either case, improved irrigation management by itself will only result in applied water reductions on-farm. It will not reduce the amount of water needed to meet crop ETAW requirements; only crop fallowing or switching to crops with lower ETAW will have this effect. Improvements in irrigation efficiency may simply mean that a farmer dependent on upstream surface runoff into a drain may no longer have that supply available to be used to meet ETAW for his or her crops.

- Water transfers within and between agricultural water agencies has been a method of mitigating the worst economic impacts of shortage for many years. Such transfers can permit the continued production of high-income annual crops, provide the final irrigation to protect a substantial investment in an annual crop, or protect long-term investments in trees and vines. As shortages become more frequent and are of larger duration and size, this strategy becomes more costly and less likely to be as successful as in prior years. This is an additional burden on the viability of agriculture. An increasing market for agricultural to urban transfers, a consequence of decreasing urban water service reliability, is likely to exacerbate this by being a more financially attractive alternative to transfers within the

agricultural community.

- Although the environmental report cites income from water transferred to urban users as a boon to agricultural areas, if these transfers involve crop fallowing to any significant degree, the negative impacts on those affected by crop production levels and the variability in those levels can be serious. The report does not address this issue even though reduced production levels and increased variability in some geographic areas are likely even before additional transfers to urban areas are considered. Agricultural areas have historically relied upon intra-agency and inter-agency transfers to preserve trees and maintain production of higher-valued crops. Urban areas are planning increased reliance on agricultural to urban transfers to meet growing supply reliability needs even without the proposed standards. The proposed standards would not only present additional constraints to moving transferred water across the Delta, under the impact assessment assumptions in the DER, they would require an additional reliance on such transfers to manage economic impacts.

- The DWR Drought Water Bank experience and subsequent studies of that experience have shown that transfers from agricultural areas have substantial local "third-party" economic effects and that local governmental agencies are extremely concerned about their impacts. This concern is very likely to reduce the willingness of such areas to make water available for transfer as the size and frequency of such transfers is increased. In addition, large transfers from a single region or those that would substantially affect the production of a single type of crop (which would be more likely with a larger reliance on transfers) would be likely to severely affect some sectors of the local economy. This impact would not be mitigated by payments to farmers by urban areas because such income would not be likely to find its way to the affected parties (water sales which result in fallowed crops--more likely as the size of transfers increase--would not make up for income lost by seed sellers, crop haulers, or crop processors). Although overall income to a community may not suffer, some sectors of the economy may suffer severely. The effect of the proposed standards will be to increase the frequency and severity of water shortages to urban and agricultural users. Severity will be affected both in terms of water availability in any one year and the duration of shortages over multiple years. The analysis in the SWRCB's environmental report is based on impacts assessed by water year category and without consideration of how those shortages are actually allocated and the economic, financial, social, and physical consequences of shortages in preceding years. These consequences can be severe depending upon the geographic region in question and the severity of antecedent shortage events. Although the risk of agricultural impacts has been historically mitigated by the ability of agriculture to make internal water transfers and pump groundwater, these options can be jeopardized by increased transfers from agricultural uses to urban uses and by worsening of overdraft conditions due to increased reliance on groundwater. Water transfers from agricultural areas involving